International Journal of Innovative Research in Science and Technology
Volume 01, Issue 01, August 2021
www.ijirst.com

AI Based Assistance for Visually Impaired People Using TTS (Text To Speech)

P. Swetha[1], Dr. Tilottama Go Swami[2]
[1](M.Tech Scholar, Department of CSE, Anurag Group of Institutions, Hyderabad, Telangana, India)
[2](Professor, Department of CSE, Anurag Group of Institutions, Hyderabad, Telangana, India)

To Cite this Article
P. Swetha, Dr. Tilottama Go Swami, "AI Based Assistance for Visually Impaired People Using TTS (Text To Speech)", International Journal of Innovative Research in Science and Technology, Vol. 01, Issue 01, August 2021, pp.:008-014.

Abstract: *Living alone in today's world is essential for every human being, but it becomes a challenge for those who have vision impairments. A person with a visual impairment is unable to detect or feel the outside environment. These people need certain resources in order to operate autonomously. With advancements in technology such as mobile connection and artificial intelligence, it became easier to maintain them in their daily lives. Our study involves using artificial intelligence, image recognition, and navigation to provide a workaround for individuals with visual disabilities. Our project is carried out by building a PI camera on a Raspberry Pi that guides them using TTS, a GPS module, and the use of a smartphone to traverse the site, as well as a sensor to identify obstructions. It can also analyze images and convert them into words, allowing them to communicate more effectively with the rest of the world.*

Keywords*: Raspberry PI 3 Model B+, HC-SR04 Ultrasonic Sensor, Algorithm, Flow Chart*

I. Introduction

Visually impaired people describe a number of problems with existing technologies when it comes to connecting to printed text, including accuracy, mobility, and performance. We provide an intelligent technology that allows the vision impaired to correctly and efficiently read printed information. Citizens would utilize a camera-based help method for reading text documents in the planned experiment. The frame is equipped to estimate the distance of the item based on range in an embedded device developed on the Raspberry Pi board, a on board and an ultrasonic sensor.

II. Definition of the Problem and a Work Plan

The next experiment necessitates the creation of a gadget that collects visual information from the pi monitor on the shoulder brace of a person with a vision impairment. The graphic data is transmitted to the Raspberry Pi microprocessor, which uses artificial intelligence to measure the visual text information in its audio format. Obstacles will be detected using an Ultra-Sonic sensor that works at shoulder height in a range of 8-10 cm. The ability to recognize dangers in close proximity enables the user to flee in their own path. While the API is running, a GPS device installed on the Raspberry Pi board transmits the user's location. When the maintainer sends a request letter, the Wi-Fi on-board transmits the location to the internet server.

III. Application of the Methodology

The framework was divided into components, with each module reflecting the system's unique goals. This technique will be simple to incorporate into the device troubleshooting procedure as the company grows. Furthermore, in addition to device maintenance and stability, the components must be combined to form the whole operating system. Project definition, project simulation, material gathering, Python application development, program testing, device integration, and verification are all part of the process.

IV. Experimental Setup

Figure 1 displays the machine block diagram. We also built an experimental setup utilizing different hardware modules. This setup tests the proximity and perception of the setting with A.I and produces an audio performance. We address briefly the hardware modules in the installation in the following segments.

Hardware Modules:

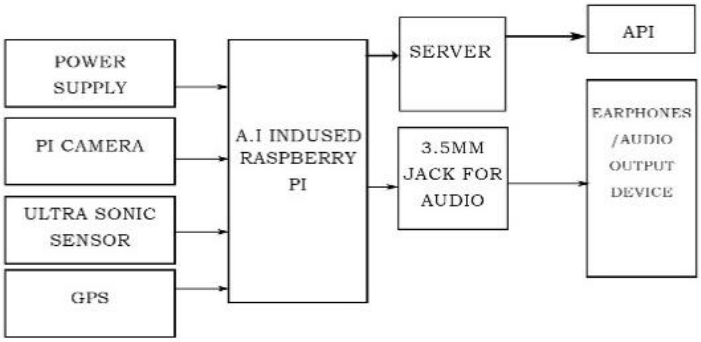

Figure no 1: Block Diagram

Raspberry PI 3 Model B+:

The Raspberry Pi 3 B+ is the last redesign of the Raspberry Pi 3 series, using a BCM2837B0 Cortex-A53 (ARMv8) CPU running at 1.4GHz on a 64-bit SoC. 2.4GHz and 5GHz cellular LAN networking using IEEE 802.11b/g/s/ac. Models with Bluetooth 4.2 and BLE (Bluetooth low energy). IEEE 802.11b/g/n/ac Wireless LAN is the on-board standard for internet connectivity. GPIO entry pins header with an extra 40 pins. The current full-size HDMI generation's audio video performance is available for quality output. There are four USB 2.0 ports for external connection. Raspberry Pi camera connection through CSI camera port. Raspberry Pi touchscreen connection through DSI monitor port. 4-pole stereo output and composite camera port Micro SD slot allows you to load and save your operating system. 5V/2.5A DC control entrance Control over Ethernet (PoE) assistance (requires separate PoE HAT).

The following are the reasons why I chose ARDUINO UNO:

- Low-cost (about $35)
- Massive computational capacity on a little board
- Multiple interfaces are available (HDMI, multiple USB, Ethernet, onboard Wi-Fi and Bluetooth, many GPIOs, USB powered, etc.)
- Python is useful on Linux (making it easy to build applications)
- With the assistance of the community, examples are publicly available.
- -Creating such an embedded board would be very expensive and time consuming.

Figure no 2: Raspberry Pi 3 Model B+

Table no 1: Raspbery PI 3 Technical Specification

Microprocessor	Broadcom BCM2837 64bit Quad Core Processor
Processor Operating Voltage	3.3V
Raw Voltage input	5V, 2A power source
Maximum current through each I/O pin	16mA
Maximum total current drawn from all I/O pins	54mA
Flash Memory (Operating System)	16Gbytes SSD memory card
Internal RAM	1Gbytes DDR2
Clock Frequency	1.2GHz

Power Supply:

A power supply is an electrical device that generates and distributes electricity with a charge.

The main function of a power supply is to convert energy from a source into the proper voltage, power, and frequency to power the cargo.

An energy input connects both power supplies, which accepts electricity from a source, and one or more power output connections, which provide electricity to the load.

Figure no 3: Power Supply

PI Camera:

The Raspberry Pi Camera v2 is the most recent official camera board from the Raspberry Pi Foundation.

The Raspberry Pi Camera Module v2 is a high-resolution 8-megapixel Sony IMX219 image sensor with fixed focus lenses that was custom-designed for the Raspberry Pi.

The Raspberry Pi camera module can take both high-resolution video and still pictures. It's simple to use for beginners, but it has a lot to offer current users who want to expand their knowledge. There are a number of videos on the internet showing individuals using it in time, slow motion, and other visual tricks. You may also utilize our libraries to create camera effects.

The module contains a 5-metric, fixed-focus sensor that supports 1080p30, 720p60, and VGA90 video formats, as well as capturing silences if you're doing nitty-gritty. A 15cm ribbon cable connects it to the Raspberry Pi's CSI port. The MMAL and V4L APIs may be used to access it, and many third-party libraries, such as the Pi-camera Python library, are intended to do so.

The camera module is well-known for its use in home security and wildlife camera traps.

Figure no 4: Pi Camera

HC-SR04 Ultrasonic Sensor:

Ultrasonic transducers are a kind of sensor that may be divided into three groups: transmitters, receivers, and transceivers. Transmitters convert electrical signals into ultrasounds, receivers convert electrical signals into ultrasounds, and transceivers transmit and receive ultrasounds. Ultrasound transducers, like radar and sonar transducers, are often employed in applications that identify targets by analyzing reflected signals. Calculating the duration between sending a signal and receiving an echo, for example, may be used to determine an entity's distance. The configuration of transducers varies greatly depending on their intended use; those used for diagnostic purposes, such as the range-finding applications mentioned earlier, are typically less effective than those used to change the properties of the liquid medium or achieve the liquid medium's goals. impacts that be chemical, biological, or physical (e.g. erosive).

Figure no 5: HC-SR04 Ultrasonic Sensor

V. Hardware Setup

The below figure shows the full hardware setup of the system.

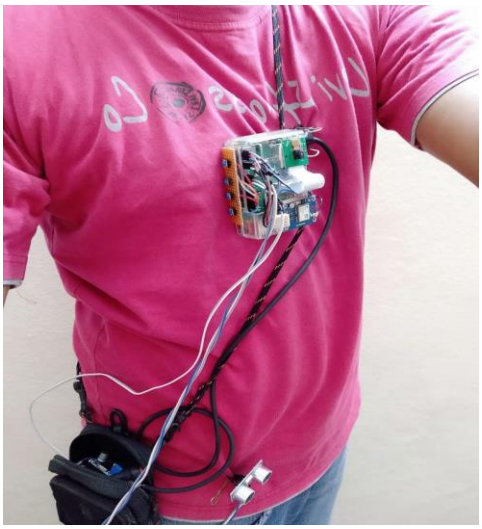

Figure no 7: Implementation of Hardware Setup

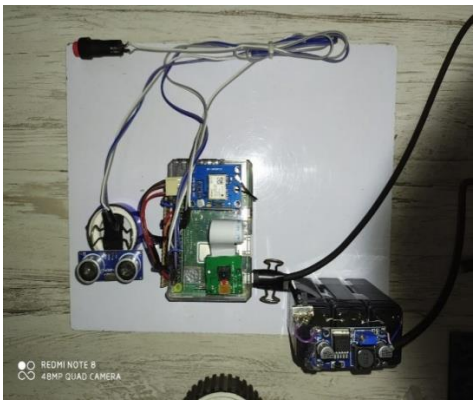

Figure no 8: Hardwar

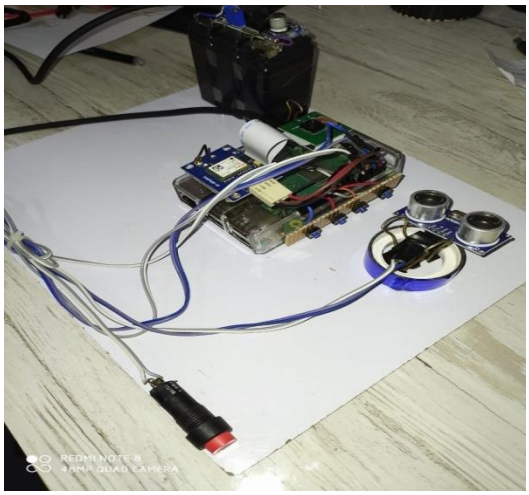

Figure no 9: Model Setup

VI. Algorithm and Flowchart

Algorithm:

- Before turning on the power, the Raspberry Pi initializes the libraries for the pi microphone, ultrasonic sensor, GPS module, and Espeak; once all the libraries are initialized, the ultrasonic sensor starts detecting the vicinity in range. • When a sensor detects an item within its range, the data is transmitted to the Espeak controller for distance measurement and data storage.
- There are two approaches of using the technique. The mechanism returns to the ultrasonic sensor for distance control if the button is not pressed.
- When the button is pressed, the pi camera is activated, and the picture is analyzed by the AI on the Raspberry Pi.
- The GPS gadget transmits its location to the server.
- The camera's processed.jpg file is now converted to an Espeak text file.
- Espeak converts this text file into its corresponding audio format, which the customer may listen to.

Flowchart:

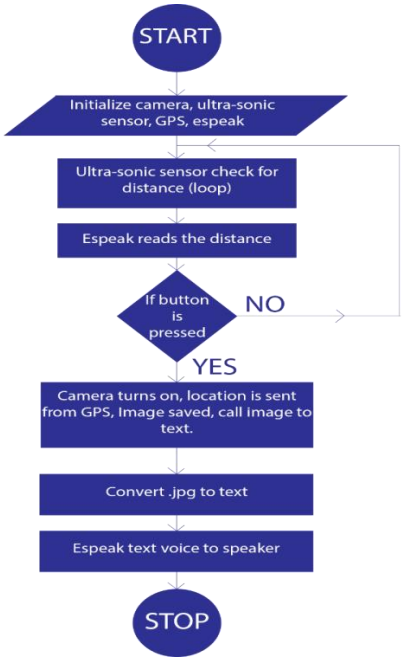

Figure no 10: Flow Chart

VII. Advantages and Limitations

Advantages:

1. The most significant advantage is that it detects text and provides voice for visually impaired people.
2. It enables those with visual problems to notice objects before they cause harm.
3. Using a mobile device API, the device's GPS system makes it simple to determine the user's current location.
4. Data computations are more easier and more effective now that A.I. is included in this project.

Limitations:

Because people with visual impairments listen to a screen reader read the computer content, the correct meaning of a word is not always grasped, especially when it comes to medical terminology, etc.

VIII. Perspective on the Future

It is clear from our current work that the technique we have developed works absolutely well in the house. This technique is slightly better than other people's previous efforts, and I intended to make some further changes as part of my work. The gadget will be converted to a web-based control system in the future using GPRS technology, allowing customers to see the system remotely over the Internet. A new feature will be added to monitor the whole area. Sensors such as a barometer air quality control, a gas detector, and a web interface may be integrated into a single device that calculates not just temperature and humidity but all other characteristics as well.

IX. Conclusion

It is often needed for individuals who have a vision impairment. People with visual impairments may use it to rapidly understand text without the need for assistance. You'll continue to do this to understand the text on the tablet, books, and other surfaces. Only with this method can individuals who are visually impaired read text in the same way that normal people do. The sounding voice of a machine is used by display readers, which is very dull for others. Some companies try their best to create voice synthesizers that can mimic how people read a sentence, such as proper intonation, but I believe that, although considerable progress has been made in recent years, they are still a long way from their goals.

References

[1]. HongguangXu,FamingLi,ChunyuChen,Xianhong Dong. NOKIA mobile phone LCD module LPH7366 principle and its application. Foreign electronic components. pp 5557,2004.

[2]. Dong, Wei, et al. "Mosaic: Towards city scale sensing with mobile sensor networks." Parallel and Distributed Systems (ICPADS), 2015 IEEE 21st International Conference on. IEEE, 2015.

[3]. Patel, Riki H., Arpan Desai, and Trushit Upadhyaya. "A discussion on electrically small antenna property." Microwave and Optical Technology Letters 57.10 (2015): 2386-2388.

[4]. David, Chavez M., et al. "A low-cost, rapid-deployment and energy-autonomous wireless sensor network for air quality monitoring." Sensing Technology (ICST), 2015 9th International Conference on. IEEE, 2015.

[5]. Upadhyaya TK, Kosta S, Jyoti R, Palandoken M; Negative refractive index material-inspired 90-deg electrically tilted ultra wideband resonator. Opt. Eng. 0001;53(10):107104. doi:10.1117/1.OE.53.10.107104.

[6]. Shanko, Eriola J., and Michalis G. Papoutsidakis. "Real time health monitoring and wireless transmission: A μController application to improve human medical needs." E-Health and Bioengineering Conference (EHB), 2013. IEEE, 2013.

[7]. Upadhyaya, T.K., Kosta, S.P., Jyoti, R. and Palandöken, M., 2016. Novel stacked μ-negative material-loaded antenna for satellite applications. International Journal of Microwave and Wireless Technologies, 8(2), pp.229-235.

[8]. Patel, Riki H., et al. "Design of S-Shape GPS Application Electrically Small Antenna." World Academy of Science, Engineering and Technology, International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering 9.4 (2015): 480-483.

[9]. UNO, ARDUINO. "DEVELOPMENT OF ROBOTIC ARM USING."

[10]. Bacci, C., et al. "Preliminary Result of Frascati (ADONE) on the Nature of a New 3.1-GeV Particle Produced in e+ e− Annihilation." Physical Review Letters 33.23 (1974): 1408.

[11]. Dalsania, Piyush, et al. "Analysis of multiband behaviour on square patch fractal antenna." Communication Systems and Network Technologies (CSNT), 2012 International Conference on. IEEE, 2012.

[12]. Salford, Leif G., et al. "Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones." Environmental health perspectives111.7 (2003): 881.

[13]. Upadhyaya, TrushitK.etal. "Miniaturization of tri band patch antenna using metamaterials." Computational Intelligence and Communication Networks (CICN), 2012 Fourth International Conference on. IEEE, 2012.

[14]. Kosta, Shiv Prasad, et al. "Human blood-based electronic transistor." International Journal of medical engineering and informatics 4.4 (2012): 373-386.

[15]. Riki H patel, arpan H Desai, Trushit Upadhyaya; "Design of H-Shape X-Band Application Electrically Small Antenna", International Journal of Electrical Electronics and Data Communication (IJEEDC), Volume-3, Issue-12. Pp 1-4, 2015 IRAJ DOI Number –IJEEDC-TRAJ- DOI-3486.

[16]. Markovà, Eva, et al. "Microwaves from GSM mobile telephones affect 53BP1 and γ-H2AX foci in human lymphocytes from hypersensitive and healthy persons." Environmental health perspectives 113.9 (2005): 1172.

[17]. Patel, Riki H., Hardik Modi, and Vrunda S. Patel. "Mobile Effect on Human Body." (2015).

[18]. Mortazavi, S. M. J., et al. "Increased radioresistance to lethal doses of gamma rays in mice and rats after exposure to microwave radiation emitted by a GSM mobile phone simulator." Dose-response 11.2 (2013): dose-response.
[19]. Ultrasonic Transducers: Materials and Design for Sensors, Actuators and Medical Applications.
[20]. Piezoelectric Transducers and Applications.
[21]. Westerveld, Wouter J (2014). Silicon photonic micro-ring resonators to sense strain and ultrasound (Ph.D.). Delft University of Technology.
[22]. S.M. Leinders, W.J. Westerveld, J. Pozo, P.L.M.J. van Neer, B. Snyder, P. O'Brien, H.P. Urbach, N. de Jong, and M.D. Verweij (2015). "A sensitive optical micro-machined ultrasound sensor (OMUS) based on a silicon photonic ring resonator on an acoustical membrane"
[23]. Gibbs, Samuel (18 February 2015). "Raspberry Pi becomes best-selling British computer". The Guardian. Retrieved 28 December 2016.
[24]. Cellan-Jones, Rory (5 May 2011). "A£15 computer to inspire young programmers". BBC News.